

## NIST in Space: Better Remote Sensors for Better Science

Completed Technology Project (2012 - 2013)



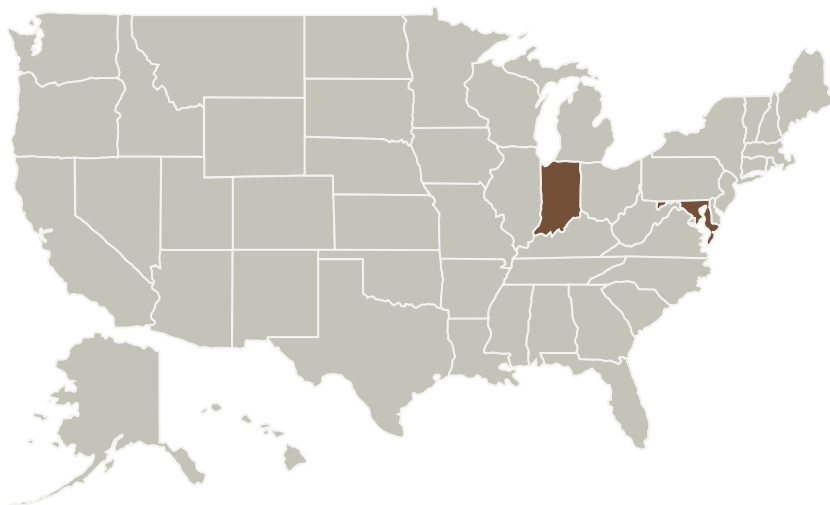
## Project Introduction

This NASA Innovative Research Grant activity conducts engineering analysis to demonstrate the feasibility and advantages of applying a breakthrough remote sensor calibration concept to a wide range of future NASA remote sensor science missions, e.g., PACE, GEO-CAPE, CLARREO, HySpIRI, GACM and Heliophysics research.

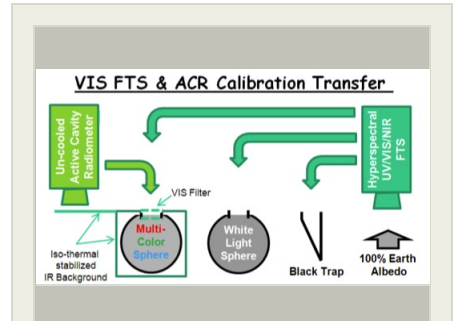
## Anticipated Benefits

Commercialization of the concept for use in electro-optic laboratories worldwide is foreseen. Any scientific application requiring precision photon flux measurements in the 250 - 3000 nm wavelength range will benefit.

## Primary U.S. Work Locations and Key Partners



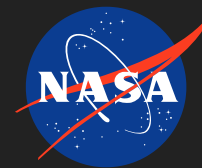
Organizations Performing Work	Role	Type	Location
ITT Exelis Geospatial Systems	Lead Organization	Industry	
ITT Space Systems, LLC	Supporting Organization	Industry	Rochester, New York
L-1 Standards and Technology, Inc.	Supporting Organization	Industry	



Project Image NIST in Space:  
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## Primary U.S. Work Locations

Indiana	Maryland
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## Project Transitions




## September 2012: Project Start



**June 2013:** Closed out

**Closeout Summary:** The objective of this research was to determine feasibility of improving measurement accuracy of space based remote sensors operating in the UV/VIS/NIR bands (250 nm - 3000 nm) by an order of magnitude over technology currently used in space and in electro-optic laboratories throughout the world. Improvements in measurement accuracy are needed to benefit a broad range of science in the field. Specifically, our objective was to devise a practical system architecture that could achieve measurement accuracies comparable to the National Institute of Standards and Technology (NIST) while operating in a space flight environment.

## Images



# NIST in Space: Better Remote Sensors for Better Science


**JR. Joseph Pennell / TTT Exelis**

G-1 Dr. Steven Lunsford, U.S. Standards & Technology

## Objectives

- Develop breakthrough UV/VIS/NIR remote sensor calibration transfer
- Improve accuracy one order-of-magnitude over current technology
- Extremotely low power (5W) traceable
- Enable laboratory-type calibration accuracy in a space-based environment
- Spectrally resolved over full solar range

## VIS FTS & ACR Calibration Transfer



### Approach:


- Combine 4 subsystems
  - Uncooled Array Ceramic Bulbs (ACB) for G18 calibration of UV/VIS/NIR sources
  - Cooled integrating sphere with multi-solar disk source of diffuse light over background
  - White light integrating sphere
  - Low noise heterodyne beat UV/VIS Fourier Transform Spectrometer
- 52 channel heterodyne beat integrating sphere used to recalibrate white light source daily
- Measure thermal ambient stabilizes spectroscopy
- FTS used as transfer standard

### Key Milestones

<ul style="list-style-type: none"> <li>- Project Start</li> <li>- Define UV/VIS/NIR sources</li> <li>- G18 Spectralized ACB feasible in space</li> <li>- Space feasibility for 100% earth orbital range</li> <li>- Acquire instrument concept funding</li> <li>- System architecture for impact hardware</li> <li>- Risk Reduction Iterative Iteration 1</li> <li>- Final Report</li> </ul>	<p>8/1/02</p> <p>10/15/02</p> <p>1/10/03</p> <p>1/10/03</p> <p>1/20/03</p> <p>4/10/03</p>
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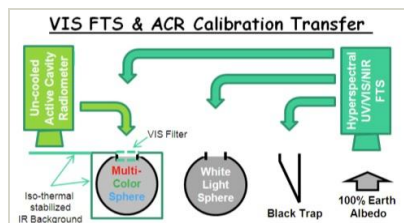
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## Project Image NIST in Space: Better Remote Sensors for Better Science

(<https://techport.nasa.gov/image/102227>)



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Project Image NIST in Space:  
Better Remote Sensors for Better  
Science  
(<https://techport.nasa.gov/image/102192>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

ITT Exelis Geospatial Systems

**Responsible Program:**

NASA Innovative Advanced Concepts

## Project Management

**Program Director:**

Jason E Derleth

**Program Manager:**

Eric A Eberly

## Principal Investigator:

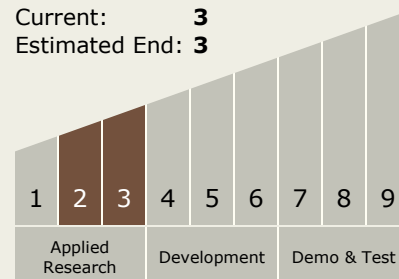
Joseph P Predina

### Technology Maturity (TRL)

Start: **2**

Current: **3**

Estimated End: **3**



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## Technology Areas

### Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - └ TX11.4 Information Processing
    - └ TX11.4.4 Collaborative Science and Engineering

## Target Destination

Earth